

## TWO NEW SPECIES OF GALAXIID FISHES FROM THE LAKE PEDDER REGION OF SOUTHERN TASMANIA

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(Plates XIV-XV)

### INTRODUCTION

Collections of galaxiid fishes from the Lake Pedder region of southern Tasmania by A. Neboiss and C. McCubbin in 1965, by W. D. Williams and party in 1966, and by the author in 1967, have provided the material for this paper. Two new species are described, with remarks on their relationships and ecology. The occurrence of a third species in the region is noted.

The above collections represent the only records of galaxiids from a comparatively large portion of Tasmania between and including most of the drainage basins of the Gordon and Huon rivers. As galaxiids are the dominant element in the native fish fauna of the rest of Tasmania, it is not surprising that the little known southern part should yield new species.

Aquatic habitats in the Lake Pedder region can be broadly divided on a physical basis as follows: (1) Lake Pedder itself, in the headwaters of the Serpentine R. (Gordon R. drainage), about two miles square and relatively shallow, with wide sandy beaches and little rooted aquatic vegetation; (2) swamps and slow-flowing streams with aquatic and overhanging terrestrial vegetation and a substratum with considerable organic detritus, situated in a flat plain draining into Lake Pedder or the Serpentine R.; (3) streams with steep gradients draining ranges to the north and south of Lake Pedder; and (4) small glacial lakes high in the Frankland Ranges (S. and W. of Lake Pedder), e.g. Lake Surprise, about 400 yards in diameter, with a rocky bottom and, in parts, a thick blanket of algae. At the east end of the Frankland Ranges, the line of the divide between the Serpentine and Huon Rivers lies in the plain and is scarcely distinguishable, suggesting that some continuity of headwaters may occur with periods of heavy rain and consequently allow migration of aquatic organisms from one river to the other.

In the descriptions below, methods of making counts and measurements follow Hubbs and Lagler (1958), except that (1) the caudal peduncle is measured along its dorsal length, and (2) vertebrae counts represent the total number of distinguishable centra minus two in each case, i.e. the ural vertebrae are not counted. The total count is given for dorsal and anal fin rays. Abbreviations used in the text are, "LT"=total length, "LS"=standard length, "f"=frequency. Where counts are given for paired characters, those of the left side are listed first. For the locality records listed, the figure in parentheses following the date indicates the number of specimens. Collections were made using a dip-net and a  $\frac{3}{8}$ " mesh seine. The type-series of each species (and all material collected by the author) were initially fixed in hexamine neutralised formalin and subsequently transferred to 70% ethyl alcohol.

### SYSTEMATIC ACCOUNT

*Galaxias pedderensis* sp. nov.

(Plate XIV)

*Holotype*: a female 49 mm. standard length, reg. no. D.941, Tasmanian Museum, Hobart. Named from the type-locality.

*Type-locality*: Lake Pedder, southern Tasmania, near the mouth of the inflowing stream from Lake Maria, and including the stream itself up to 100 yards from the mouth, 1 February, 1967.

*Paratypes*: 19 specimens: 16 from the same locality and at the same time as the holotype, 3 from a pond about 400 yards south of the type locality, 3 February, 1967.

*Diagnosis*: distinguished from all other species of *Galaxias* by a combination of the slender caudal peduncle, single pyloric caecum and the low number of vertebrae.

*Description*: based on the type and 19 paratypes, 32.0-70.0 mm. LS, of which 7 specimens were cleared and stained. Biometric data are presented in Tables 1 and 3.

Body fusiform, head with flat dorsal profile, depressed between the orbits. Jaws sub-equal anteriorly; posterior termination of the maxilla varies between verticals from the anterior one fifth to one half of eye. Premaxilla and dentary each with about 12 to 16 teeth, no lateral canines; 7 to 8 teeth on the mesopterygoid and a double row of about 5 on the lingual plate; both upper and lower pharyngeal teeth present.

A large open pore on each side of each tubular anterior nostril, and 1 immediately antero-medial to each simple posterior nostril; 2 pairs of pores in the interorbital space, respectively about 0.33 and 0.8 of the eye diameter from its anterior margin; 1 pore on the upper margin of each eye slightly posterior to the second interorbital pair, a suborbital (but no postorbital) pore; 2 pores between the maxilla and eye and 2 each side below the jaws; 6 pores along the preoperculum, the first below or slightly anterior to the suborbital pore (slightly posterior in two of the largest specimens).

Gill rakers on lower part of first arch 2 to 3 times longer than wide, of about equal size in individuals, except for the anteriormost 1 or 2.

One short pyloric caecum present, from 1.5 to 3.0 times longer than width at base (4 specimens examined). Least depth of the caudal peduncle varies between 0.32 and 0.37 of its dorsal length.

Pectoral fins rounded, extending from 0.40 to 0.51 of the distance to the origin of the pelvic fins. Pelvic fins with small unpaired 'splint' ray on outer margin and extending from 0.54 to 0.69 of the distance to the origin of the anal fin. A maximum number of 2 branches per ray in both paired fins. Anal fin commences between 0.38 and 0.64 of the dorsal fin base behind the dorsal fin origin. Anterior 4 to 6 dorsal rays and 5 to 6 anal rays unbranched, remainder 2-branched in specimens longer than 43 mm. LS. Last ray divided from base (except in 1 specimen). Caudal fin emarginate, with caudal ridges scarcely extending to the limit of the anal fin. A maximum of 4 branches in a single caudal fin ray.

*Branchiostegals*: counts of branchiostegal rays for 12 specimens are 7-7(f.3), 8-8(f.5), 9-7(f.1), 9-8(f.1), 9-9(f.2).

*Vertebrae*: parapophyses not fused with centra on prepelvic trunk vertebrae. Counts of trunk and caudal vertebrae for 17 specimens, covering a total range of 49 to 52, are 29-21(f.1), 30-21(f.2), 30-22(f.1), 31-19(f.2), 31-20(f.1), 32-18(f.2), 32-19(f.2), 33-16(f.1), 34-16(f.2), 34-17(f.1), 35-16(f.2).

*Colour in alcohol*: upper body and sides with irregular blotches, dark brown to light grey in colour according to the degree of expansion of the melanophores. Ventral surface light coloured, except that the pigmented coelomic wall may be visible. Fins hyaline, the fin rays (except the posterior pectoral rays) outlined with dark pigment. In the larger specimens dermal pigmentation extends on to the anterior part of the dorsal fin, and to a lesser extent, the anal fin.

*Colour in life*: upper body and sides light yellow-brown with blackish-brown blotches; lower sides of trunk grey-green; ventral surface whitish. Fins light yellow-brown at bases, becoming colourless distally.

*Size*: Maximum size observed 80 mm. LT, 70 mm. LS (a female). Largest male 53 mm. LT, 46.5 mm. LS.

*Breeding*: in 10 specimens, only the 6 largest, from 43 mm. LS (4 females and 2 males), showed any trace of gonad development, and this was at a very immature stage. Females appear to reach a larger size than males, otherwise there is no apparent difference between the sexes.

*Habitat*: abundant near the edge of Lake Pedder, and in a flowing stream entering the lake. A few specimens were collected from a pond near Lake Pedder (type locality of a second species described below).

*Affinities*: *G. pedderensis* appears most closely related to *G. johnstoni*<sup>1</sup> Scott. The lower number of vertebrae (Table 3), the single pyloric caecum (cf. 2 in *johnstoni*), the narrower caudal peduncle (32.5-37.0, mean = 34.6% of the dorsal length, cf. 39.0-47.0, mean = 43.1%), and the longer head (23.1-26.0, mean = 24.7% of LS, cf. 21.0-23.0, mean = 22.0%) serve to distinguish *G. pedderensis* from *G. johnstoni*. The specimens used of each species are of comparable size (32.0-51.5, mean 40.8 mm. LS, cf. 40.5-60.0, mean 44.9) so that little of the difference in the morphometric characters may be attributed to allometric growth.

*Distribution*: known only from Lake Pedder and immediate surrounds, southern Tasmania.

#### *Study material and locality records*

Lake Pedder, southern Tasmania, near the mouth of the inflowing stream from Lake Maria, and from the stream itself up to 100 yards from the mouth. 1. ii. 1967 (49) R. Frankenberg, B. Cane & G. Wells. Type-series—holotype in Tasmanian Museum, Hobart, paratypes in Department of Zoology Museum, University of Melbourne (M.U.Z.D.).

Pond on the east bank of Lake Pedder, about 400 yards south of the stream entering Lake Pedder from Lake Maria. 1 and 3.ii.1967 (3) R. Frankenberg (M.U.Z.D.).

Lake Pedder. 3.iii.1966 (4) W. D. Williams. (M.U.Z.D.).

Lake Pedder. 30.i.1965 (6) A. Neboiss. (National Museum, Victoria).

#### *Galaxias parvus* sp. nov.

(Plate XV)

*Holotype*: a female 41 mm. standard length, reg. no. D.940, Tasmanian Museum, Hobart. The name *parvus* is from the Latin meaning 'small'.

*Type locality*: Pond on the east bank of Lake Pedder, about 400 yards south of the stream entering Lake Pedder from Lake Maria, southern Tasmania, 1 and 3 February, 1967.

*Paratypes*: 19 specimens, 17 of which were collected at the same time and from the same locality as the holotype, and 2 from Lake Pedder near the mouth of an inflowing stream about 400 yards north of the type locality, 1 February, 1967.

*Diagnosis*: distinguished from all other species of *Galaxias* by a combination of the rounded caudal fin, and the low number of vertebrae and pelvic fin rays.

*Description*: based for the most part on the holotype and 9 paratypes, 22.5 to 54.0 mm. LS. Osteological features and branchiostegal fin ray counts derive from 7 cleared and stained paratypes, 20 to 34 mm. L.S. Biometric data are presented in Tables 2 and 3.

Body fusiform; head flat between the orbits and with a rounded anterior profile. Jaws equal anteriorly, or lower jaw slightly protrudes; posterior termination of the maxilla varies between verticals from the anterior margin of eye and anterior third of eye.

Premaxilla and dentary each with about 16 teeth of fairly even size, those on the dentary being slightly larger. Lingual teeth well developed, about 5 each side along a rather narrow lingual plate; mesopterygoid also with about 5 teeth; both supra- and infrapharyngeal teeth present.

A large open pore on each side of each tubular anterior nostril and 1 immediately anterior and medial to each simple posterior nostril; a pair of pores in the interorbital space 0.25 to 0.33 of the eye diameter from its anterior margin; a line of 4 pores between the posterior margins of the eyes, the middle 2 sometimes slightly more anterior; a sub-orbital and a postorbital pore; 2 pores between the maxilla and the eye and 2 each side below the jaws; 5 pores along the preoperculum, the first below and distinctly posterior to the suborbital pore; numerous smaller pores on the head.

Gillrakers on the lower part of the first arch vary in length from about 1 to 3 times width at base, but, except for the anterior few, are of similar size in any one specimen.

Pyloric caeca absent (6 specimens examined). Least depth of the caudal peduncle varies between 0.42 and 0.50 of its dorsal length.

Pectoral fins broadly rounded with a short basal peduncle and extending from 0.40 to 0.53 of the distance to the origin of the pelvic fins. Pelvic fins with a small unpaired 'splint' ray on the outer margin and extending from 0.49 to 0.66 of the distance to the origin of the anal fin. Dorsal and anal fins rounded, with 4 to 6 unbranched anterior rays. A small and usually unbranched posteriormost ray in these fins appears distinctly separate from the penultimate ray (except in one specimen) and has been counted separately. The anal fin commences between 0.13 and 0.40 of the dorsal fin base behind the dorsal fin origin. Caudal fin truncate to rounded (slightly emarginate in juveniles); ridges from the caudal fin extend anteriorly, the ventral ridge reaching to or nearly to the base of the anal fin. Where an odd number of principal caudal rays occurs, the lower lobe usually contains one more ray than the upper (one exception). A maximum number of 7 branches in a single fin ray for the caudal fin and 4 for all other fins. *Branchiostegals*: counts of branchiostegal rays for 7 specimens are 7-6(f.1), 7-7(f.3), 8-7(f.3).

*Vertebrae*: fused parapophyses on all trunk vertebrae. Counts of trunk and caudal vertebrae for 15 specimens, covering a total range of from 44 to 47 are 25-19(f.1), 25-20(f.1), 25-21(f.2), 26-18(f.1), 26-19(f.1), 26-20 (f.1), 26-21(f.1), 27-17(f.1), 27-19(f.3), 27-20(f.3).

*Colour in alcohol*: body above lateral line light grey-brown to dark brown, with small irregularly spaced denser blotches. Sides below lateral line lighter in colour, ventral surface whitish. Fins hyaline, the rays outlined with black pigment.

*Colour in life*: back and sides yellow-brown, lower sides grey-green; belly whitish, except for a more or less conspicuous salmon-pink to gold coloration anterior to the pelvic fins—this colour was more evident in the smaller specimens. A greenish iridescence on the operculum. Fins light yellow-brown on the proximal part, hyaline distally.

*Size*: maximum size observed 60.5 mm. LT., 54.0 mm. LS (female). Largest male 53.5 mm. LT, 38.5 mm. LS.

*Breeding*: in 10 specimens (5 males and 5 females), immature gonad development was evident in all, the smallest being 22.5 mm. LS. The largest specimens are females, otherwise there appears to be no obvious sexual dimorphism.

*Habitat*: Swamps, still pools and backwaters; collected mainly by sweeping a dipnet through vegetation on the margins of pools. Juveniles were collected in open shallow water on the edge of Lake Pedder together with adults and juveniles of *G. pedderensis*.

*Affinities*: in size, general appearance, and in characters such as fused prepelvic parapophyses, 5 to 6-rayed pelvic fins, less than 50 vertebrae, and the rounded

caudal fin with a tendency towards fewer than 16 principal fin rays, *G. parvus* departs from the more usual *Galaxias* condition, as represented by *G. pedderensis* and *G. johnstoni*, towards the Australian species, *Brachygalaxias pusillus* Mack. These features apart, however, *G. parvus* shows greater osteological similarity to the above two species of *Galaxias*. On this basis, and from its association with *G. pedderensis*, *G. parvus* is regarded as being phylogenetically closest to *G. pedderensis*, the two representing ecospecies which have diverged morphologically in the course of adaptation to differing habitats—*G. parvus* to swamp conditions, and *G. pedderensis* to the more open lake-stream habitat. The features of similarity noted above between *G. parvus* and *Brachygalaxias pusillus* are therefore considered to be due to parallel evolution, and the adaptive nature of the resulting 'morphotype' is supported by personal observations on *B. pusillus*, which typically occurs in swampy conditions, i.e. similar to those of *G. parvus*.

*Distribution:* Lake Pedder and headwaters of the Huon and Serpentine Rivers, southern Tasmania.

#### *Study material and locality-records*

Pond on the east bank of Lake Pedder, about 400 yards S. of the stream entering Lake Pedder from Lake Maria. (Gordon R. drainage). 1 and 3.ii.1967 (23) R. Frankenberg. Type-series—holotype in the Tasmanian Museum, Hobart, paratypes in the Department of Zoology Museum, University of Melbourne (M.U.Z.D.).

Pond near H.E.C. Hut (= type locality?), Lake Pedder, 3.iii.1966 (1) W. D. Williams. (M.U.Z.D.).

Lake Pedder, near mouth of inflowing stream from Lake Maria, 1.ii.1967 (5) B. Cane, R. Frankenberg & G. Wells. (M.U.Z.D.).

Anabranche of Huon R., approx. 2.5 miles SE. of Lake Pedder, 2.ii.1967 (29) R. Frankenberg. (M.U.Z.D.).

Mosquito Creek, SW. of Mt. Bowes (Huon R. drainage), 11.ii.1965 (1) C. McCubbin. (National Museum, Victoria).

#### *Galaxias affinis* Regan?

Attention is drawn to the existence of a third species of *Galaxias* from the Lake Pedder region. This is represented by two specimens, 50 and 75 mm. LS, from Lake Surprise. These differ from the other two species in having two pyloric caeca (a vestigial third in one), and markedly higher vertebrae numbers (Table 3). The colour pattern also differs, consisting of dark spots and irregular vertical bars. On the basis of these features, these specimens may represent juveniles of *G. affinis* Regan, but further work is necessary on this ill-defined species before any confidence could be placed in such a designation.

#### *Material examined.*

Lake Surprise (Huon R. drainage), Tasmania. 3.iii.1966 (2) W. D. Williams (M.U.Z.D.).

#### *Galaxias johnstoni* Scott

Comparative material of *G. johnstoni* (from the Derwent R. system, Tasmania) comprises the type-series (4 specimens from a tributary of the Nive R. (Scott, 1936), and 3 specimens from the Clarence Lagoon, in the headwaters of the Nive R., collected by J. Wilson, 27.iii.1962 (M.U.Z.D.). This material is the total recorded for the species.

#### SUMMARY

Two new species of galaxiid fishes, *Galaxias pedderensis* and *G. parvus* are described from the Lake Pedder region of southern Tasmania and their affinities discussed. The existence of a third species in the area, questionably referred to *G. affinis* Regan, is noted.

TABLE 1. Biometric data for the type specimen and 9 paratypes of *Galaxias pedderensis*

	Holotype	Holotype & 9 paratypes	
		Range	Mean
Pectoral fin-rays	13, 13	12-15	13.3
Pelvic fin-rays (paired)	7, 7	7-7	7.0
Dorsal fin-rays	12	11-13	11.7
Anal fin-rays	13	13-14	13.2
Principal caudal fin-rays	16	16-16	16.0
Branched caudal fin-rays	14	14-14	14.0
Gill-rakers (lower limb)	11	10-11	10.6
Total length in mm.	56	37.0-58.0	46.9
Standard length in mm.	49	32.0-51.5	40.8
As a percentage of standard length:			
Head length	24.5	23.1-26.0	24.7
Body depth (maximum)	14.3	14.0-15.9	14.7
Body width (maximum)	12.2	11.4-13.0	12.2
Snout tip to pelvic fin-origin	53.1	51.3-54.0	52.8
Snout tip to dorsal fin-origin	68.8	66.7-70.3	68.6
Snout tip to anal fin-origin	72.9	71.0-74.6	72.9
Caudal peduncle depth	7.6	7.2- 8.3	7.6
Caudal peduncle dorsal length	21.3	20.4-23.1	22.0
Pectoral fin length	12.9	11.6-14.3	12.7
Pelvic fin length	11.6	10.7-12.6	11.5
As a percentage of head length:			
Eye width	25.0	24.0-27.5	25.6
Snout length	20.8	20.0-25.3	21.8
Interorbital width	30.0	28.7-32.5	30.1

TABLE 2. Biometric data for the type specimen and 9 paratypes of *Galaxias parvus*

	Holotype	Holotype & 9 paratypes	
		Range	Mean
Pectoral fin-rays	13, 14	12-14	12.8
Pelvic fin-rays (paired)	5, 5	5-6	5.4
Dorsal fin-rays	12	10-12	11.3
Anal fin-rays	13	11-15	13.3
Principal caudal fin-rays	15	14-16	15.2
Branched caudal fin-rays	12	8-14	11.7
Gill-rakers (lower limb)	9	7-9	8.5
Total length in mm.	46.5	25.5-60.5	40.1
Standard length in mm.	41.0	22.5-54.0	35.1
As a percentage of standard length:			
Head length	26.3	23.1-27.5	25.4
Body depth (maximum)	18.0	14.8-19.3	17.5
Body width (maximum)	14.1	11.1-16.2	14.3
Snout tip to pelvic fin-origin	53.7	50.6-55.6	53.5
Snout tip to dorsal fin-origin	70.2	67.9-70.7	69.3
Snout tip to anal fin-origin	75.1	70.7-75.3	72.9
Caudal peduncle depth	8.5	8.3-10.2	9.2
Caudal peduncle dorsal length	19.0	18.9-22.2	20.3
Pectoral fin length	12.2	12.0-16.3	13.5
Pelvic fin length	10.2	9.6-11.5	10.3
As a percentage of head length:			
Eye width	26.9	21.6-31.9	28.0
Snout length	19.4	16.0-20.0	18.0
Interorbital width	27.8	23.3-36.7	30.9

TABLE 3. Fin ray and vertebrae counts in three species of *Galaxias* from the Lake Pedder region and *G. johnstoni* Scott. (D) = Derwent R. drainage, (H) = Huon R. drainage, (G) = Gordon R. drainage, N = number of specimens.

Species	Locality	Pectoral						Pelvic				
		N	11	12	13	14	15	16	5	6	7	8
<i>G. parvus</i>	Lake Pedder (G) ....	20	1	8	8	3			10	10		
	Upper Huon R. (H)	15		7	7	1				15		
<i>G. pedderensis</i>	L. Pedder (G) ....	20		1	11	6	2				19	1
<i>G. johnstoni</i>	Nive R. & Clarence Lag. (D) ....	6	1	4	1						5	1
	L. Surprise (H) ....	2						1	1		2	

Species	N	Dorsal				Anal					Principal		Caudal	
		10	11	12	13	11	12	13	14	15	14	15	16	17
<i>G. parvus</i>	20	3	9	8		2	5	6	5	2	2	8	9	1
	15			12	3			5	7	3			14	1
<i>G. pedderensis</i>	20		8	11	1	1		14	4	1			20	
<i>G. johnstoni</i>	7	1	3	3		1	2	4					7	
<i>G. affinis</i> ?	2				2			1	1				2	

Species	N	Vertebrae															
		44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
<i>G. parvus</i>	15	3	2	6	4												
	15			6	5	3	1										
<i>G. pedderensis</i>	18						1	7	9	1							
<i>G. johnstoni</i>	3										3						
<i>G. affinis</i> ?	2														1	1	

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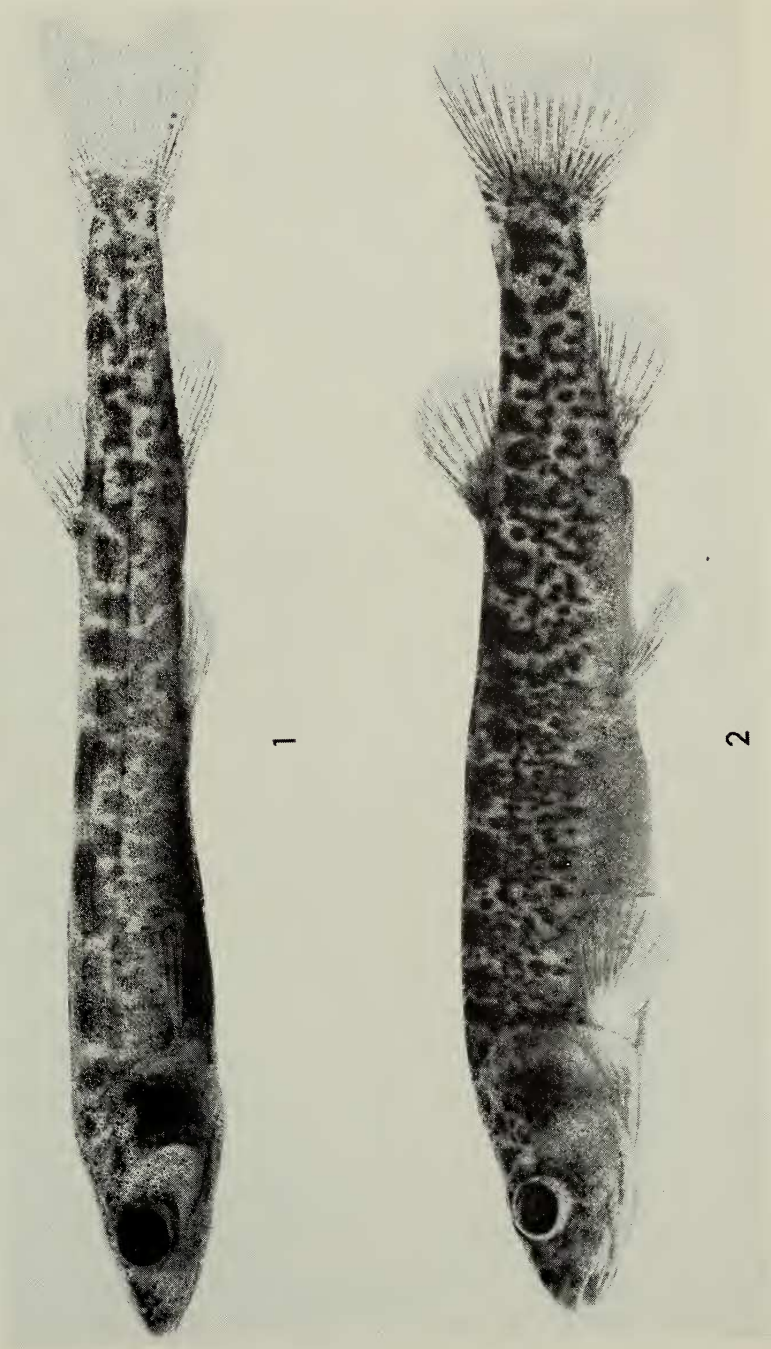
#### EXPLANATION OF PLATES

##### PLATE XIV

*Galaxias pedderensis*.—(1) holotype, 49 mm. LS, (2) a paratype 60 mm. LS from a pond near Lake Pedder.

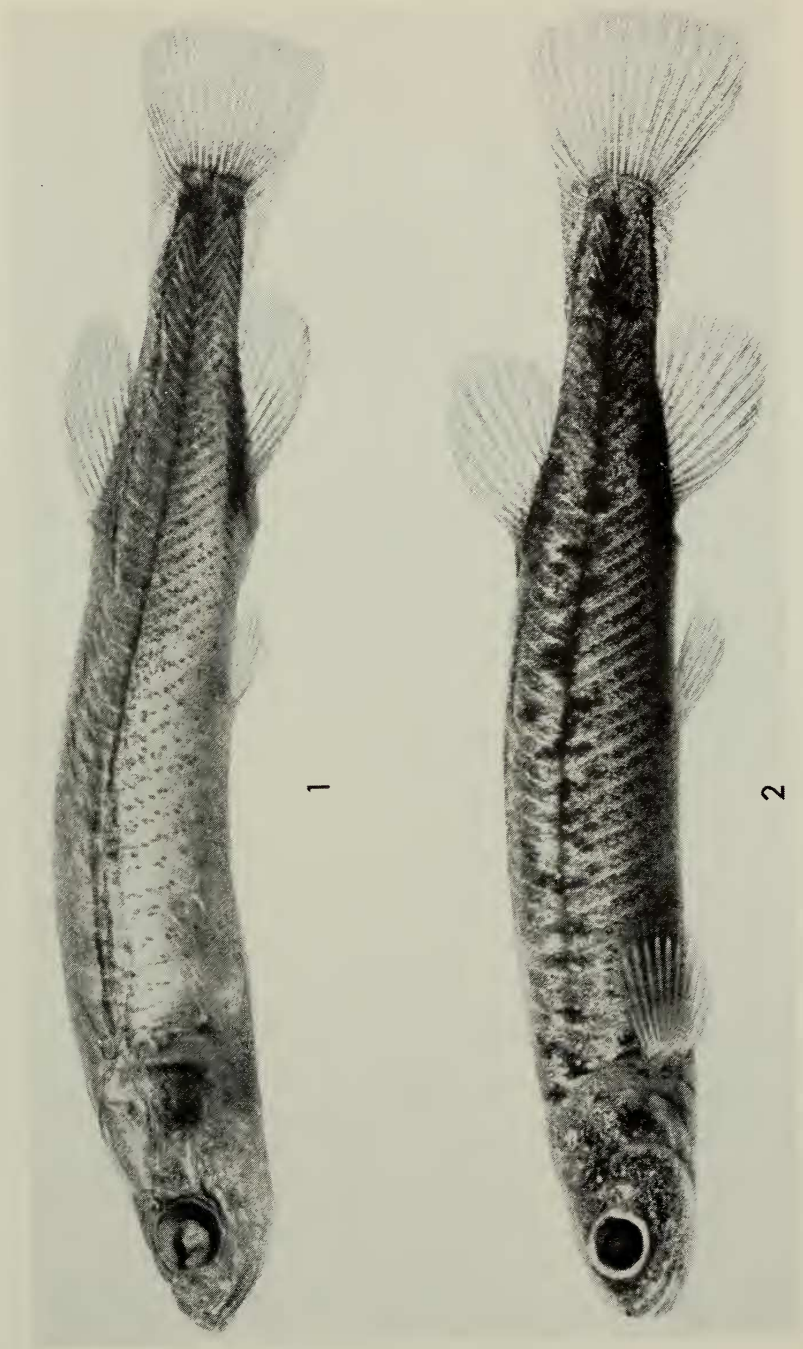
##### PLATE XV

*Galaxias parvus*.—(1) holotype, 41 mm. LS, (2) a specimen 40 mm. LS from an anabranh of the Huon R. near Lake Pedder.



*Galaxias pedderensis* Frankenberg





*Galaxias parvus* Frankenberg